FEDERAL AVIATION AGENCY SPECIFICATION

DIGITAL DATA COMMUNICATIONS SYSTEM SERVICE

1. SCOPE

1.1 Scope.- This specification states the conditions and requirements for providing narrow band Digital Data Communications System (DACOM) Service for use in the National Airspace System. When used in conjunction with narrow band, voice-bandwidth communications channels, a leased Service will provide for transmission of data from Government equipment at a radar/beacon site to FAA equipment at Air Route Traffic Control Centers (ARTCC) and to Air Defense Command (ADC) systems, interchange of air traffic control data between ARTCC's, or both. Supplements to this specification will furnish specific information as to the site locations, option requirements, and other necessary information.

1.2 Classification.- Two different type systems of DACOM Service are specified herein; each system provided by a Service differs in the terminal equipment configuration and system data transfer rates.

System	Terminal equipment locations
Simplex DACOM Service	Radar/beacon data acquisition site and ARTCC site(s), and ADC systems
Duplex DACOM Service	ARTCC sites

2.2 Other publications.- The following publications, of issues in effect on date of invitation for bid, form a part of this specification:

Tariff FCC No. 237 Channels for Data Transmission filed by American Telephone and Telegraph Co.

Tariff FCC No. 237 Domestic Leased Facility Service filed by Western Union Telegraph Co.

(Copies of this specification may be obtained from Federal Aviation Agency, Washington, D. C. 20553, ATTN: Contracting Officer. Requests should fully identify material desired, i.e., specification number, date, amendment number; also, requests should state the contract involved, or other use to be made of the requested material.)

(Single copies of the Military standard may be obtained from Federal Aviation Agency, Washington, D. C. 20553, ATTN: Contracting Officer; mail requests should cite the invitation for bids, or contract for which the specifications are needed; mail requests, if found acceptable, will be forwarded to a Military supply depot for filling, hence ample time should be allowed.)

(Information on obtaining copies of FCC tariffs may be obtained from either American Telephone and Telegraph Co., Long Lines Department, 32 Avenue of the Americas, New York 13, New York, or from Western Union Telegraph Co., 60 Hudson Street, New York, New York.)

3. REQUIREMENTS

3.1 Items of services to be furnished by the contractor.-

(a) Simplex DACOM Service (3.4 to 3.5.12; 3.7; 3.9)

(b) Duplex DACOM Service (3.4 to 3.4.10; 3.6 to 3.6.6; 3.7; 3.9)

3.2 Definitions.-

3.2.1 DACOM.- The term "DACOM" shall denote the acronym for a Digital Data Communications System Service provided for by this specification.

applicable.

3.2.4 Rise and fall times.- Rise time is measured as the time duration between the 10% and 90% amplitude values along the leading edge of the unit interval. Fall time is measured as the time duration between the 90% and 10% amplitude values along the trailing edge of the unit interval.

3.2.5 Ground.- Unless otherwise specified, the term "ground" shall denote the signal ground of contractor's terminal equipment.

3.2.6 Terminal equipment.- The term "terminal equipment" shall denote all equipment furnished and installed by the contractor at each of the designated locations as a part of a system required for a specified classification of Service, i.e., Simplex DACOM Service or Duplex DACOM Service.

3.2.7 System.- The term "system" shall denote all the terminal equipment and interconnecting communications channels furnished by the contractor to provide a required classification of Service to meet system performance requirements.

3.2.8 Communications channels.- The term "communications channels" shall denote full-period, narrow-band voice-bandwidth circuits whose characteristics are equivalent to common-carrier data channels on file with the Federal Communications Commission and described in Tariff FCC No. 237.

3.2.9 On-line.- The term "on-line" shall denote the operational status of a system when all associated terminal equipment and communications channels are available to meet specified system performance requirements.

3.2.10 Bit error rate.- The term "bit error rate" is defined as follows:

$$\text{Bit error rate} = \frac{\text{Total number of information bits transmitted} - \text{Total number of information bits correctly rec'd}}{\text{Total number of information bits transmitted}}$$

3.2.11 Bit synchronous data.- The term "bit synchronous data" defines the process of timing input and output (I/O) data on binary data channels of the terminal equipment that interface with external Government digital equipment. All I/O data are controlled by timing signals (clocks) generated by the contractor's terminal equipment. Clock timing pulses are synchronous with each data signal element (data bit) at the I/O data interfaces.

plus noise power (N), to that of noise power (N) in the absence of data signals on a channel.

Example: C-message weighted measurement

$$(S+N)/N = -16 \text{ dBm} = (-16 + 90) \text{ dBm} = 74 \text{ dBRN-C}$$

$$N = -41 \text{ dBm} + (90 - 1.5) \text{ dBm} = 47.5 \text{ dBRN-C}$$

$$(S+N)/N = 26.5 \text{ dB}$$

3.2.13 Impulse noise.- The term "impulse noise" denotes short duration, low repetition impulsive type noise interference measured at the receiver data input interface using a Western Electric Model 6A Impulse Noise Counter, or equal.

3.2.14 Abbreviations.-

c/s - Cycles per second	dB - Decibel
kc/s - Kilocycles per second	0 dBm - 10^{-3} watt
mc/s - Megacycles per second	(S) - Denotes singular and/or plural
BPS - Bits per second	mA - Milliampere

3.2.15 Standard design-center values for ambient temperature and power source.- The following parameters are defined as the standard design-center values for ambient temperature and power source to be provided by the Government for the contractor's terminal equipment.

	Parameter	Standard Design - Center Value
(a)	Ambient temperature	+ 30° C
(b)	AC line voltage	120 V
(c)	AC line frequency	60 c/s

3.2.16 Service conditions.- The "service conditions" set forth below define the conditions under any practical combination of operational environment for terminal equipment during which all performance requirements for a system of DACOM Service shall be met.

(d) Duty: Continuous

(e) Ambient conditions:

Environment I

For terminal equipment at radar/beacon sites:

Temperature:	-10° C to +50° C
Relative humidity:	5% to 90%

Environment II

For terminal equipment at ARTCC sites:

Temperature:	+10° C to +40° C
Relative humidity:	10% to 80%

3.3 Items and services to be furnished by the Government.-

3.3.1 Floor space allocation for terminal equipment.- All terminal equipment required for DACOM Services at radar/beacon sites and ARTCC sites shall be located in Government buildings on Government property. At each site the Government will allocate floor space within the building for installation of the contractor's equipment. This space will be provided in an enclosed area with lighting and access through a lockable doorway. Floor space allocation within the enclosed area shall be based on a maximum of one cabinet-type relay rack per system with adjacent working space for maintenance of terminal equipment.

3.3.2 Panel space in cabinet-type relay rack.- Panel space will be provided in a cabinet-type relay rack located in the Government-equipment room area at each site for mounting the jack panel(s) (3.4.4.1) and terminal status monitor(s) (3.4.6). Terminal equipment circuit demarcation (3.4.7) shall be installed in this rack. For each system installed at a site, front panel space requirements shall be limited to 5 $\frac{1}{4}$ inches maximum for mounting standard 19-inch rack panels.

3.3.3 Typical layout drawings.- Typical layout drawings for the Government equipment room, floor plan of enclosed area for terminal equipment, and power source will be furnished by the Government to the contractor, as required.

requirements specified in the following subparagraphs shall be furnished with each system of Simplex DACOM Service and Duplex DACOM Service provided for by the contract. All other functions necessary to provide the features, capabilities and system performance required by this specification shall be incorporated and furnished even though the function or item is not individually identified.

3.4.1 System functional requirements.- Design of terminal equipment and associated interconnecting communications channels shall interface with external Government equipment and provide overall system functional operation in accordance with the block diagrams of Figure 1 and Figure 2. Block diagrams show the system functional requirements but they are not intended to define methods by which they are accomplished. The standby transmitter and standby receiver channel equipment shown in Figure 2 shall be provided only with Duplex DACOM Service. Figure 2 shows one of two identical duplex terminal equipment groups that are required with each duplex system.

3.4.2 Communications channels.- Communications channels shall follow the same geographical routing between interconnecting sites, or at the option of the Government they shall follow separate geographical routes. Unless approved by the Government, the requirements of this paragraph to provide diversification of communications channels preclude time division multiplexing techniques for transmission of baseband data in a system of Simplex DACOM Service over a voice-bandwidth communications channel.

3.4.2.1 Optional channel diversification.- When specified in the contract, geographical routing of communications channel shall be diversified between the serving test centers of the transmission media that interconnect terminal equipment at each site. When ordered after the initial system installation, channel diversification shall be provided within 3 months from the date of request.

3.4.3 Transmitter and receiver synchronization and control.- Separate clock synchronization output signals shall be provided with each channel of terminal equipment at each site for use in controlling external Government equipment to permit bit synchronous data to flow to and from the contractor's terminal equipment. Data input to each transmitter and data output from each receiver on channel interface circuits (3.5.8) shall be controlled by clock output signals of the associated channel.

3.4.3.1 Transmitter data input channel.- Bit-serial data signal elements, in polar binary encoded non-return-to-zero format, will be strobed to a

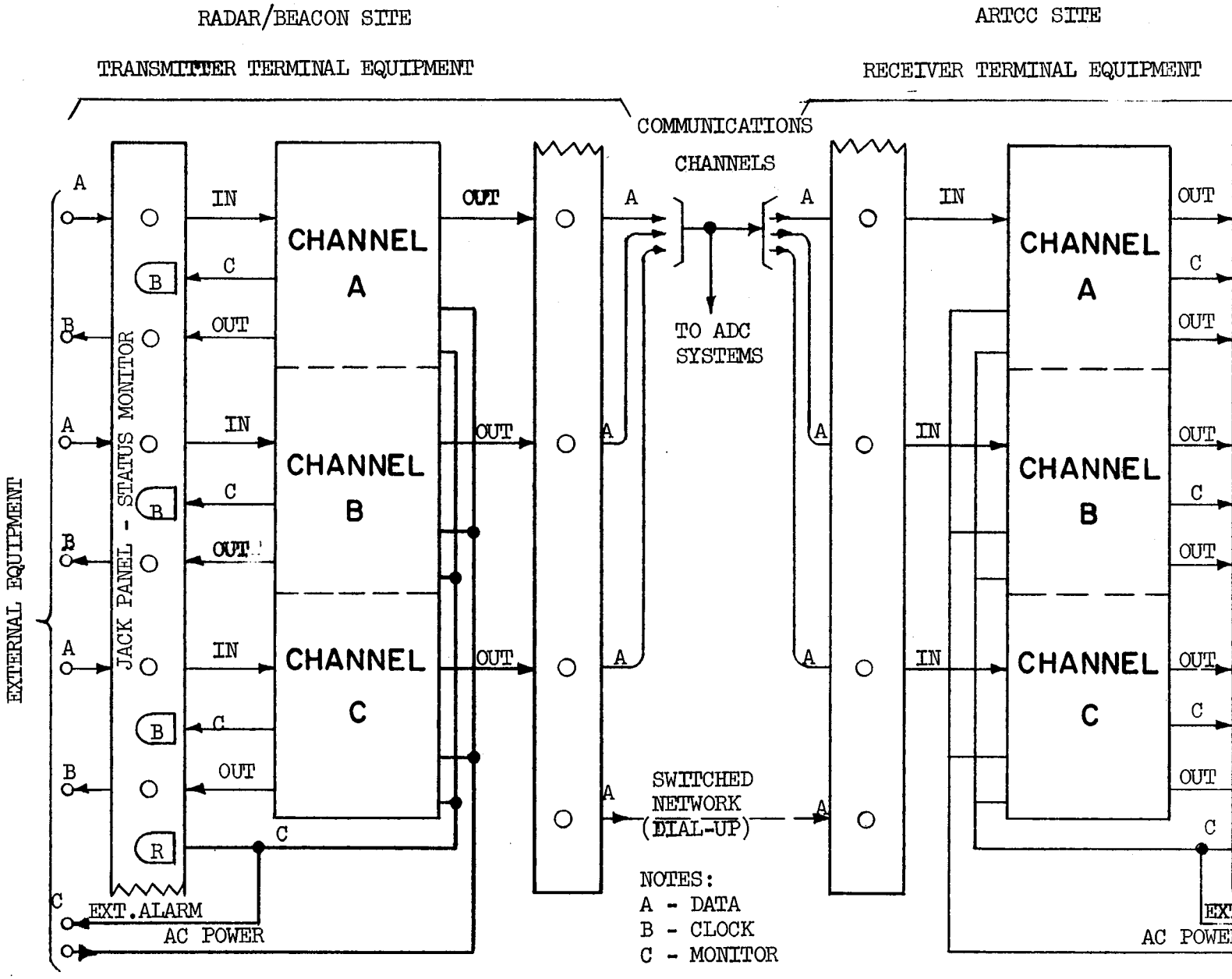

FIG. 1 BLOCK DIAGRAM OF SIMPLEX DACOM SERV

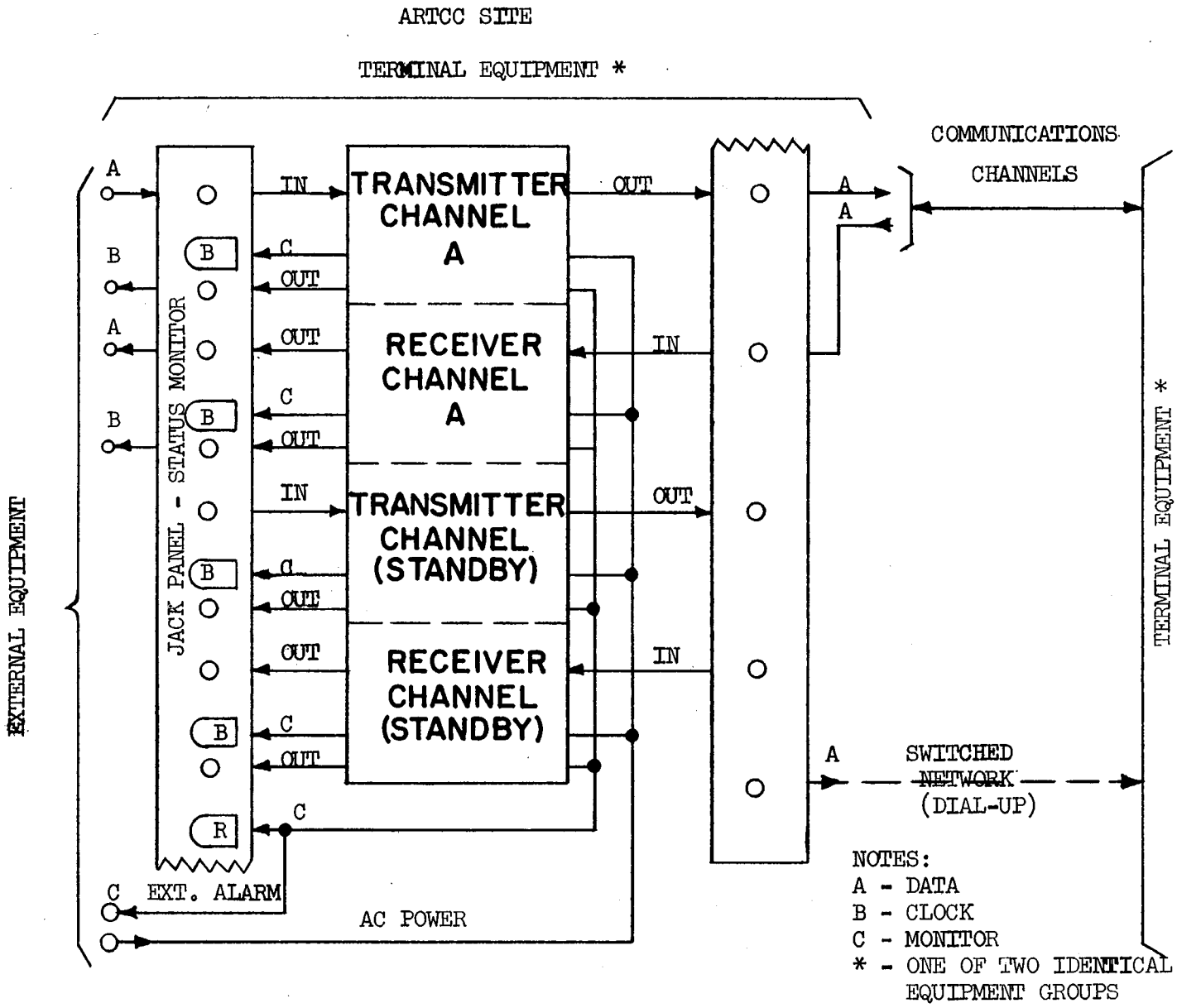

FIG. 2 BLOCK DIAGRAM OF DUPLEX DACOM SERV

polar binary encoded nonreturn-to-zero format shall be strobed out of a receiver data output channel under control of the receiver clock at a constant baud or signaling information rate. The external equipment connected at the interface circuit will accept bit-serial data that are synchronous with the clock output signal. Data output transitions shall be synchronized with the receiver clock such that the midpoint of each data bit interval (3.5.8.3.1(b)) occurs at the negative-going (OFF) (3.5.8.3.2) transition of the clock output signal.

3.4.4 Transmitter and receiver channel patching.- Provisions shall be included at each site to permit selective patching of all external data circuits of each channel and their associated clock output signals. During a period of system degradation or failure, or an outage for preventive maintenance activity scheduled by the contractor, patching or equivalent switching provisions will permit a Government operator at a site to reconfigure a system, when feasible, and continue to operate a simplex service at a reduced system data transfer rate, or to place standby channel terminal equipment (Figure 2) on-line for operation in either simplex or duplex service until the affected system is restored to normal by the contractor.

3.4.4.1 Interconnection jack panel.- In meeting the requirements for channel patching, the Government envisions the use of a two-row jackfield of 3-circuit telephone-type jacks. When site operational requirements dictate the necessity to reconfigure the system to operate in a degraded mode, a Government operator will by selective patching of the input/output data, clock timing circuits and communications channels continue to operate a service at a reduced data transfer rate until the system is restored to normal. The jack panel or equivalent switching provisions shall be mounted in the relay rack located in the Government equipment room area (3.3.2). In addition, the jack panel shall include provisions for access to dial-up switched networks for use only during operation in an emergency back-up mode (3.4.5).

3.4.5 Switched network access.- Provisions shall be included on the jack panel (3.4.4.1) to permit data transmissions over common-carrier dial-up switched networks. This degraded mode of system operation will normally be required only when a failure occurs on a communications channel and operational requirements of the system dictate the use of switched-network facilities for an emergency back-up media. A standard telephone instrument with alternate voice/data provision shall be used to establish the emergency back-up channel; however, the telephone instrument is an optional item of terminal equipment to be furnished only at the time of installation when specified in the contract or an amendment thereto.

3.4.6.1 Status monitoring indicators.- Status monitoring indicators shall be mounted on a panel and installed by the contractor in a Government-furnished rack (3.3.2). The indicators may be integrated on a common panel with transmitter and receiver channel patching functions (3.4.4). Individual status indicators when energized for each channel (Figure 1 and Figure 2) shall indicate the on-line status of a system at the site as being NORMAL. Blue lamps shall be used and shall be de-energized whenever a failure occurs or malfunctioning exists. A single red ALARM lamp shall be provided and shall be energized whenever a failure or malfunction exists in the terminal equipment. In addition, a dry closure NORMAL/ALARM external monitor circuit equivalent to a SPDT circuit, rated at 1A-120V AC, shall be provided for connection to Government equipment for remote monitoring the system status. A push button type switch shall be included on the panel to bypass an ALARM indication on the external monitor circuit. The bypass feature shall be automatically reset and the ALARM lamp de-energized whenever all channel NORMAL lamps are energized. Appropriate markings on the panel to identify all indicators and switch shall be included.

3.4.7 Terminal equipment circuit demarcation.- Input/output data and clock output signals to external equipment shall be terminated in a junction box or panel provided by the contractor and mounted in a Government-furnished rack (3.3.2). All circuit demarcation hardware shall be provided for use by the Government during installation to interface with the following external circuits:

(a) Data input/output circuits (3.5.8.2.1 & 3.5.8.3.1)

(b) Clock output circuits (3.5.8.2.2 & 3.5.8.3.2)

(c) NORMAL/ALARM monitor circuit (3.4.6.1)

(d) Terminal equipment system grounding (3.4.8)

Connection to data input/output and clock circuits shall be provided at BNC-type coaxial receptacles with mating connectors.

3.4.7.1 Terminal equipment AC power source.- The Government will provide the necessary cabling and conduit for transmission from the site AC power source to the contractor's disconnect power switch located in the enclosed area (3.3.1). All terminal equipment shall be designed to operate from a single-phase two-wire AC line source. The design-center values for the power source shall be 120V and 60 c/s.

to external Government equipment that interface with the terminal equipment. The contractor shall specify any special grounding requirements. System grounding shall assure that no degradation of signals between interfacing equipments occur due to cross-coupling or loop currents through the ground system. Any operational problems resulting from improper grounding and bonding or interference to external equipment shall be the contractor's responsibility to eliminate.

3.4.8.1 Ground networks.- All terminal equipment, including panel units, shall provide two discrete ground networks; one that bonds together all equipment assemblies with the cabinet or frame to form a protective ground network; and another that connects all signal return ground wires together. Each network shall be isolated from the other and from earth ground except where the networks and common ground are interconnected by removeable jumpers on terminal blocks at the terminal equipment circuit demarcation (3.4.7). Terminals shall be provided for external connection to earth ground, protective and signal ground networks.

3.4.9 Workmanship.- All work done at terminal equipment sites shall be neat, orderly, and of the best quality in keeping with decor of the radar/beacon and ARTCC buildings. Installation crews shall keep the area clear during the installation period and leave premises broom clean upon completion. All debris shall be removed from the job site and disposed of by the contractor's personnel.

3.4.10 System maintenance.- The contractor shall be responsible for conducting all maintenance of a system provided under the contract for Simplex and Duplex DACOM Service(s). All system failures and outages resulting in downtime (3.5.1, 3.6.1) for maintenance, routine or otherwise, shall be considered when computing overall system availability. Any maintenance by the contractor concerning a system which will result in an interruption to service or degrade system performance shall be coordinated and advance permission obtained from the appropriate Government official prior to starting such maintenance activity. It is imperative that all servicing and adjustments to the Service provided shall be accomplished so as to hold system downtime to an absolute minimum. It shall be the responsibility of the contractor to provide security clearance for his installation and maintenance personnel as required.

3.5 Simplex DACOM service performance requirements.- A system of Simplex DACOM Service (Figure 1) shall provide for continuous and simultaneous transmission of data over each of the communications channels interconnecting

equipment shall meet performance requirements over the range of service conditions (3.2.16).

3.5.1 Overall system availability.- Computed on a monthly basis, each system of the Service shall provide an overall on-line availability of not less than 0.9970. In meeting this requirement, system availability (A) shall be determined by using the following formula where (N) is the number of days in the month and the total system downtime (D) is recorded in hours and tenths of an hour.

$$A = \frac{24N-D}{24N}$$

Total downtime shall include all elapsed downtime in any channel of the 3-channel system resulting from 1) preventative maintenance downtime, and 2) time during a period when a system fails to meet the Service performance requirements.

3.5.2 System data transfer rate.- The overall system data transfer rate shall be 7200 BPS. Each input and output data circuit (3.5.8.2.1 and 3.5.8.3.1) of a simplex system shall provide for simultaneous interchange of bit-synchronous serial data at a rate of 2400 BPS.

3.5.3 System bit error rate.- Computed on a monthly basis, the mean bit error rate for each channel of a system, when measured at the receiver data output interface circuit in tenth of an hour intervals, shall not exceed 1×10^{-5}. This requirement shall be met using operational idle/message synchronization character (3.5.12) and data transmissions interchanged between Government equipment at a radar/beacon and ARTCC site(s).

3.5.4 Channel interchangeability.- During system downtime, the Service provided shall permit rapid re-establishment and continuance of data transmissions in a degraded mode at a reduced data transfer rate. Terminal equipment patching provisions shall permit immediate selection by a Government operator of any combination of on-line terminal equipment or communications channels which continue to indicate NORMAL operation (3.4.6.1).

3.5.5 Emergency back-up mode.- During operational periods of the system in a degraded mode (3.4.5), the mean bit error rate per channel for transmission over dial-up switched networks shall not exceed 2×10^{-5}.

3.5.6 Terminal equipment inter-channel isolation.- Removal from on-line operation or failure of any channel of terminal equipment shall not affect

within one second after restoration of the power source to within the range of service conditions. In meeting this requirement all data and clock signal levels shall recover to their normal operating range; monitor and alarm circuits shall be restored to normal; and terminal equipment shall be re-synchronized and meet system performance requirements. For the purpose of meeting this system requirement, it shall be assumed that error-free data are present on external circuits prior to, during, and after a power interruption.

3.5.8 External circuit interfaces.- Input/output data and clock circuits shall be designed to meet the electrical characteristics specified in the following subparagraphs when interfaced and operated with external equipment over interchange circuit cable lengths up to 300 feet of RG-62B/U coaxial cable. Terminal equipment shall operate with potential differences, noise impulse levels, or both, between interchange circuit network grounds (3.4.8.1) of the terminal equipment and external Government equipment grounds, up to 1 volt peak of either polarity.

3.5.8.1 Interface protection.- Terminal equipment interface circuitry shall be designed to withstand the following fault conditions:

(a) Circuit termination: open circuited or short circuited

(b) Loss of signal or power at either end of an interface circuit

(c) Transient signals, noise, etc. with levels up to ± 25V peak; steady-state or keyed signals

3.5.8.2 Transmitter channel interface.-

3.5.8.2.1 Data input circuit.-

(a)	Impedance	:	5000 ohms minimum (input resistance)
(b)	Binary logic amplitudes	:	+ 0.5 volt (binary 1), -0.5 volt (binary 0) or -0.5 volt (binary 1), +0.5 volt (binary 0). Operation using either positive or negative data logic shall be provided.
(c)	Input capacity	:	2500 picofarads maximum

(Parenthetical references apply to operation with negative data logic.) The voltage amplitude within these limits is not specified; however, the positive and negative operating amplitudes shall be balanced to within 10 percent of each other. Maximum operating current required on the input interface circuit to assume a binary logic state shall be 100 microamperes.

(e) Rise and fall times : Between 5% and 6% of the duration of the unit interval.

(f) Transient response : Referenced to the sensitivity at 40 kc/s, response of input circuitry to transients, noise, etc., shall be reduced by at least 10 dB at 50 kc/s, and reduced by at least 30 dB to 100 kc/s.

3.5.8.2.2 Clock output circuit.-

(a) Source impedance : 100 ohms maximum; short circuit current delivered to the interface shall not exceed 100 mA.

(b) Output level amplitude : Open circuit voltage shall be positive and negative 6 ± 1 volts, balanced to within 10% of each other; +6 volts (logical ON or positive), and -6 volts (logical OFF or negative).

(c) Frequency : 2400 c/s, square wave; duty cycle 50 ± 5%.

(d) Rise and fall times : Between 5% and 6% of the duration of the unit interval.

3.5.8.2.2.1 Frequency stability.- Over the range of service conditions, the clock frequency shall be within the limits ±0.01% of 2400 c/s. Stability of the clock shall be such that its output frequency does not drift beyond these limits. The drift-rate shall be no more rapid than expected from a

3.5.8.3.1 Data output circuit.-

(a) Source impedance : 100 ohms maximum; short circuit current delivered to interface shall not exceed 100 mA.

(b) Binary logic amplitudes : Open circuit voltage shall be positive and negative 6 ± 1 volts, balanced within 10% of each other; +6 volts (binary 1), -6 volts (binary 0); or -6 volts (binary 1), +6 volts (binary 0). Operation using either positive or negative data logic shall be provided.

(c) Rise and fall times : Between 5% and 6% of the duration of the unit interval.

(d) Data/clock jitter : 3% maximum of the duration of the unit interval (measured from the 50% level of the negative-going clock transition to the average zero voltage level of the data unit interval)

3.5.8.3.2 Clock output circuit.- See paragraph 3.5.8.2.2.

3.5.8.3.2.1 Frequency stability.- The contractor shall establish the frequency stability required to meet overall system performance requirements.

3.5.9 Receiver communications channel characteristics.- The contractor shall specify the following characteristics of the data input signal to the receiver channel from the communications channel that are required to assure meeting system performance requirements:

(a) Data input signal level to receiver

(b) Receiver input impedance

(c) Communications channel frequency response

(d) Communications channel envelope delay

(e) Receiver input (S+N)/N

(f) Communications channel impulse noise count

contractor may include additional monitor/control functions for determining the status of the Service being provided. However, unless approved by the Government, any additional functions shall be excluded from the system status monitor panel (3.4.6.1).

3.5.10.1 Transmitter channel monitor.-

3.5.10.1.1 Data output level.- Each channel NORMAL status indicator (3.4.6.1) shall be energized whenever the detected data output level from a transmitter to the communications channel is above the fault/alarm threshold. Whenever the transmitted data level decreases to the alarm threshold level (to be established by the contractor), the system status ALARM lamp (3.4.6.1) shall be energized.

3.5.10.1.2 Clock output level.- Functional requirements for monitoring clock output signal levels shall be the same as specified above for data output, with the exception that the alarm threshold level shall be adjustable between ± 1 and ± 4 volts, referenced to ground. In addition, the clock output signal shall be inhibited whenever the data output level is at alarm threshold level.

3.5.10.2 Receiver channel monitor.-

3.5.10.2.1 Data input level.- Each channel NORMAL status indicator (3.4.6.1) shall be energized whenever the detected data input level to the receiver from the communications channel is above fault/alarm threshold level. Whenever the received data level decreases to alarm threshold level (to be established by the contractor), the system status ALARM lamp (3.4.6.1) shall be energized.

3.5.10.2.2 Clock output level.- Functional requirements for monitoring the clock output signal level shall be the same as specified above for data input with the exception that the alarm threshold level shall be adjustable between ± 1 and ± 4 volts, referenced to ground.

3.5.10.3 Monitor performance.- Each monitor channel shall be self-monitoring and activate the monitor ALARM (3.4.6.1) whenever any circuit in a monitor fails to operate within specified limits. Monitor circuits shall not degrade the performance of terminal equipment during normal operation, maintenance, or malfunction of the monitor units. Each parameter specified shall be monitored without interaction or dependency upon any other monitored parameter of a system .

(a) At and above 200 Mc/s with all of the contractor's terminal equipment installed in position, with all cabinet door(s) open, and with one or more channels in an off-line status during maintenance periods.

(b) Below 200 Mc/s with all of the contractor's equipment in their normal operation position with all cabinet door(s) closed.

3.5.12 Idle and message synchronization character.- A system shall be designed to operate with a 13-bit idle and message synchronization control character using a format of three (3) ZERO's followed by ten (10) ONE's (...0001111111111...). During idle transmission periods when data messages are not being transferred on interchange circuits, external equipment will continuously transfer 13-bit idle characters to the transmitter channel for transmission to the distant receiver channel. This same 13-bit character shall be used for message synchronization. The ZERO data bit at the start of the message synchronization character shall be immediately preceded by a ONE data bit.

3.6 Duplex DACOM service performance requirements.- A system of Duplex DACOM Service (Figure 2) shall provide for continuous and simultaneous interchange of transmitted and received data over communications channels interconnecting the contractor's transmitter and receiver terminal equipment when installed at separate ARTCC sites. Figure 2 shows only one of two identical terminal equipment configurations required for a duplex system. The overall system availability and performance requirements in the following subparagraphs are stated in terms of a complete on-line 2-channel system. System demarcation at each site shall be at the terminal equipment interface circuits (3.4.7). Design of the contractor's terminal equipment shall meet performance requirements over the range of service conditions (3.2.16). With the exception of the changes set forth in the following subparagraphs, performance requirements for Duplex DACOM Service shall be identical to and meet performance requirements specified for Simplex DACOM Service (3.5).

3.6.1 Overall system availability.- Computed on a monthly basis, each system of a Service shall provide an overall on-line availability of not less than 0.9980. The method for computing system availability (A) shall be as specified in paragraph 3.5.1.

3.6.2 System data transfer rate.- Each input and output data circuit of a duplex system shall provide for simultaneous interchange of bit-synchronous serial data at a rate of 600 BPS.

3.6.3 System bit error rate.- Computed on a monthly basis, the mean bit error rate for each channel of a system, when measured at the receiver data output interface circuit in tenth of an hour intervals, shall not exceed 1×10^{-5}. This requirement shall be met using operational idle and message synchronization characters (3.6.5) and data transmission interchanged between Government equipment located at ARTCC sites.

3.6.4 Transmitter and receiver channel interfaces.-

3.6.4.1 Clock output circuit.- The characteristic for the clock output circuit and frequency stability shall be identical to the requirements specified in paragraph 3.5.8.2, with the exception that the output frequency shall be 600 c/s, square wave; duty cycle 50 ±5%. In the event the Government specifies one of the optional data transfer rates (3.6.2.1), the required clock output frequency shall be the same as the specified data transfer rate.

3.6.5 Idle and message synchronization characters.- The system shall be designed to operate with the following control characters:

Function	Format
Idle character	Alternate ZERO's and ONE's
Message synchronization character	...0000000000000000001...

During idle transmission periods when data messages are not being transferred on interchange circuits, external equipment will continuously transfer alternate ONE's and ZERO's to a transmitter channel for transmission to the distant receiver channel. Immediately prior to each data message, a single message synchronization character will be presented to the transmitter channel for transmission to the distant receiver channel. The ZERO data bit at the start of a message synchronization character shall be immediately preceded by a ONE data bit in the idle character bit stream.

3.6.6 Interference control.- The requirements of MIL-STD-826 specified in paragraph 3.5.11 shall not apply to Duplex DACOM Service.

3.7 Future channel for Simplex DACOM Service.- At the option of the Government an additional communications channel with associated terminal equipment shall be provided within three months from date of request. Performance requirements for this additional channel shall be identical to those specified under paragraph 3.5.

3.9 Operation and instruction manuals.- An operation and instruction manual shall be provided in accordance with the requirements of the following subparagraphs.

3.9.1 Purpose and scope of manual.- Manuals shall contain all instructions necessary for proper Government utilization of the Service provided. A section shall be provided that outlines the functional operating procedure. It shall include step-by-step procedures for the operation of all monitor/alarm and switching functions for terminal equipment. Reference to controls and lamps shall be made by the designations marked on the panels. Instructions shall be complete and in logical sequence.

3.9.2 Construction and binding.- The operations and instruction manual shall be designed so that it can be opened to any desired page and folded back upon itself so as to lay flat. Covers shall be stiff and durable. Manuals shall conform to the highest commercial standard practices.

3.9.3 Quantity.- Not fewer than two (2) operation and instruction manuals shall be provided with each system.

4. QUALITY ASSURANCE PROVISIONS

4.1 General testing provisions.- Upon completion of a leased system installation, the contractor shall demonstrate to the satisfaction of the Government that all terminal equipment functions and overall system performance when tested in an operational environment meet specified DACOM Service requirements. When any optional feature specified herein is ordered and installed after the original installation, tests shall be conducted by the contractor to demonstrate the optional features(s) provided meet specified performance requirements. All technical personnel, tools, test equipment, etc., required for performing tests shall be provided by the contractor except for the optional test provision capabilities of external Government equipment specified in paragraph 4.3.

4.1.1 System test plan and forms.- A comprehensive test procedure and test data forms which the contractor proposes for use in conducting system performance tests shall be prepared by the contractor. The test procedure shall be complete and incorporate all tests required to demonstrate specification compliance for the leased system. Block diagrams shall be included where required to clarify special test instrumentation. Three copies of the test plan shall be forwarded to Federal Aviation Agency, Washington, D. C. , 20553, ATTN: Contracting Officer, for review and

by the Government, the test plan as submitted by the contractor shall be considered approved by the Government.

4.1.2 Test data forms.- The contractor shall prepare test data forms for each system of Service subjected to test. The title sheet for each set of test data shall include Service name, the contract number and date, and the specification number and date. The individual test data forms shall indicate for each test, the applicable specification paragraph and the performance limits stated therein. The title sheet for each set of test data forms shall be signed by the contractor's test engineer and countersigned by the Government representative.

4.1.3 Notification of readiness for system tests.- After the contractor has completed all required adjustments to a system in preparation for demonstration of system performance tests, he shall notify the Government Contracting Officer in writing that he is ready for Government inspection. Such notification shall reach the Contracting Officer at least five work days before the date the contractor desires tests to start.

4.2 System operational performance tests.- With terminal equipment interfaced to external Government equipment providing operational environment data, each system shall be operated continuously during a 30-day test to demonstrate overall system availability and provide service in accordance with specification requirements. Test data forms shall include a log for the 30-day test period and shall be used to record at 24 hour intervals the following status of system performance:

(a) Total accumulated time spent in on-line operation during which the system performed in accordance with the requirements of the system test procedure. Time spent in a degraded mode of operation shall not be included as on-line time.

(b) Total system downtime. System downtime shall include all elapsed time for scheduled preventive maintenance activity and time spent in a degraded mode of operation for any channel of a system. Time to perform on-line preventive maintenance which does not require interruption or degradation of system performance shall not be included as downtime. Downtime resulting from factors external to the terminal equipment at the site shall not be charged to system downtime (e.g., a power interruption or ambient environment in excess of service conditions at either site of a system).

(c) Measured system bit error rates.

4.2.1 With terminal equipment having been previously adjusted for optimum system performance, test measurements in accordance with the test procedure shall be made and recorded at the start of the 30-day test, after an initial 15-minute warm-up period, and again at the end of the 30-day test period.

4.2.2 At the end of the 30-day test period, the following tests shall be conducted to demonstrate system performance requirements:

(a) power source interruptions

(b) channel interchangeability and patching provisions

(c) interference control (radar/beacon sites only)

(d) emergency back-up mode of operation over switched networks (when optional terminal equipment is furnished)

4.2.3 In the event a system does not meet system performance requirements of the test procedure, the Government reserves the right to require any retesting deemed necessary by the Government representatives to assure that the Service provided is meeting all specified performance requirements.

4.3 Government equipment test provision.- For measurement of system bit error rates (4.2 (c)), the contractor may utilize the parity checking provisions incorporated in external equipment which interface with the system under test for demonstrating system performance requirements. In the case of Simplex DACOM Service, the structure of the serial data stream presented at the terminal equipment interfaces consists of a 12-bit message plus odd parity. For Duplex DACOM Service, the serial data stream presented at the terminal equipment interface is composed of an 8-bit character plus odd parity.

4.4 Data reports.- At least six copies of all test data recorded during system performance tests shall be prepared by the contractor for each system installation. One copy shall be retained by the Government representative; two copies shall remain with the installation; two copies shall be forwarded to Federal Aviation Agency, Washington, D. C., 20553, Attention: Contracting Officer; and one copy shall be forwarded to the cognizant FAA Regional Office.

6.1 Intended use.- The block services specified herein are for use in conjunction with the following subsystems of the Federal Aviation Agency's National Airspace System:

(a) Transmission of digitized radar targets and weather contour data, derived from long range surveillance radars and radar beacons, over communications channels to NAS ARTCC's and to systems of the Department of Defense's Continental Air Defense and Warning Systems; and

(b) Transmission of air traffic control interfacility messages between NAS ARTCC's over communications channels.

6.2 Note on information items.- The contents of the following subparagraphs are only for the information of the contracting officer and are not a part of the requirements of this specification. They are not contract requirements nor binding on either the Government or the contractor. In order for these terms to become a part of a resulting contract, they must be specifically incorporated in the schedule of the contract. Any reliance placed by the contractor on the information in these subparagraphs is wholly at the contractor's risk.

6.2.1 Data to be supplied by the contractor.- The contract schedule should specify the following:

(a) Complete installation dimensions for terminal equipment and floor plan space requirements (3.3.1).

(b) Panel configuration for transmitter and receiver channel patching (3.4.4), terminal equipment status monitor (3.4.6), and terminal equipment circuit demarcation (3.4.7).

(c) AC power requirements per system at each site((3.3.4).

The above data should be supplied to the Government no later than 60 days after date of contract.

6.4 Terminal equipment options.- The contract schedule should specify the following:

(a) Channel diversification requirements (3.4.2.1)

(b) Provisions for alternate voice/data operation (3.4.5)

(c) Optional data transfer rate (3.6.2.1)

(d) Future channel for Simplex DACOM Service (3.7)

* * * * *

SPECIFICATION NUMBER AND TITLE	CONTRACT NUMBER

SUBMITTING ORGANIZATION	ADDRESS

SPECIFICATION USED IN:

- ☐ Direct Government Contract - No: _____
- ☐ Government Subcontract - No: _____
- ☐ Other - _____

1. Has any part of the specification created problems or required interpretation?

   A. Give paragraph number and wording.

   B. Recommendations for correcting the deficiencies.

2. Comments on any specification requirement considered too rigid?

3. Is the specification restrictive? ☐ Yes; ☐ No

   If "yes", in what way?

4. REMARKS. "Attach to this form any additional pertinent data which may be of use in improving this specification. Form with attachments should be mailed together in an envelope addressed as shown on reverse side".

SUBMITTED BY	DATE

FEDERAL AVIATION AGENCY

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Systems Standards Branch, RD-420
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Washington, D. C. 20553